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ABSTRACT

Age-related deficits may exist in episodic memory (knowledge of the context in which an item appeared previously) and semantic memory (knowledge of an item's meaning independent of the context). In order to examine adult age differences in semantic priming effects and subsequent episodic retention for visually presented words, 24 young (18-22 years) and 24 older (58 to 74 years) adults participated in a lexical decision task, requiring subjects to decide whether a "target" letter string is a word or a nonword. Each of the word targets was presented as the final item of a sentence context (i.e., a prime) that was either semantically congruous, incongruous, or neutral with regard to the target. The perceptual difficulty of the target was also varied. The semantic priming effects in lexical decision reaction time were equivalent in magnitude for the young and older adults. The reaction time data appeared to represent a generalized, age-related slowing in the speed of information processing. In unexpected tests of recall and recognition for the target words, the older adults performed significantly worse than the young adults. The present results indicate that age-related deficits in episodic memory are not accompanied by substantial changes in semantic encoding ability. (Author/BH)

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Age Effects in the Use of Sentence Context in Visual Word Recognition

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Abstract

The present experiment examined adult age differences in semantic priming effects and subsequent episodic retention for visually presented words. Twenty-four young (18-22 years) and 24 older (58-74 years) adults participated. In a lexical decision task, each of the word targets was presented as the final item of a sentence context (i.e., a prime) that was either semantically congruous, incongruous, or neutral with regard to the target. The perceptual difficulty of the target was also varied. The semantic priming effects in lexical decision RT were equivalent in magnitude for the young and older adults. The RT data appeared to represent a generalized, age-related slowing in the speed of information processing. In unexpected tests of recall and recognition for the target words, the older adults performed significantly worse than the young. The present results indicate that age-related deficits in episodic memory are not accompanied by substantial changes in semantic encoding ability.

One of the most consistent findings in research on aging is that older adults perform worse than young adults on memory tasks. There is, however, less consistency in the interpretations that have been offered to account for these findings. One theory that has received considerable attention recently is the proposal that an age-related deficit exists in semantic encoding ability. This theory employs the distinction, made originally by Tulving (1972), between episodic and semantic memory. Episodic memory refers to knowldge of the particular episode or context in which an item appeared previously, such as whether a specified word was a member of a recently presented list. Semantic memory, in contrast, refers to knowledge of an item's meaning that is independent of context, such as whether a specified word is an animal, vegetable, or mineral. Most traditional laboratory investigations of recall and recognition are tests of episodic memory. Several research programs have converged on the conclusion that, at least for verbal stimuli, the efficiency of episodic memory performance is determined by the depth of the semantic encoding that occurs when to-be-remembered items are first presented (e.g., Craik & Tulving, 1975). Thus, an age-related deficit in semantic encoding, if it does exist, could contribute significantly to the age differences that are frequently observed in tests of episodic memory.

The hypothesis of an age-related deficit in semantic encoding has received support from studies such as those of Craik and Simon (1980) and Rabinowitz and Ackerman (1982), who report that age differences in cued recall are greater as the meaningfulness of the retrieval cue is increased. These authors also propose that the age differences they obtain may be related to the attentional demands associated with semantic encoding. In these experiments, however, the presence of an age-related deficit in semantic encoding is usually inferred from subjects' performance in a test of

episodic memory. Consequently, the age differences obtained may reflect changes in retention and retrieval processes rather than in semantic encoding per se. This possibility is suggested by the fact that when the experimental task involves making a semantic decision, young and older adults appear to perform the task in a qualitatively similar manner. In the lexical decision task, for example, each trial requires subjects to decide whether a visually presented "target" letter string is a word or a nonword. Several experiments have reported that young and older adults are similar in the degree to which the speed of their lexical decisions is facilitated by the presentation, of a "prime" context that is related semantically to the target (e.g., Bowles Poon, 1981; Burke & Yee, in press; Cohen & Faulkner, 1983; Howard et al., 1981). These results indicate that the semantic encoding processes involved in the lexical decision task are relatively preserved over age. In these studies of lexical decision, however, there is no evidence that subjects were devoting attention to the priming context. An important form of such evidence would be an increase in lexical decision reaction-time when the prime context and target word are not related in an expected manner (Posner & Snyder, 1975). Consequently, although lexical-decision studies of word recognition do not support the concept of an age-related deficit in semantic encoding, it is possible that the attentional demands of the tasks were not sufficient to demonstrate this deficit.

The present experiment investigated adult age differences in a lexical decision task in which the prime was an incomplete sentence that was either semantically congruous, incongruous, or neutral with regard to the word targets. The attentional demands of the task were varied by manipulating the perceptual difficulty of the word targets. The retention of the word targets in episodic memory was tested by unexpected recall and recognition-memory tests given after the lexical decision task. If age-related deficits in

memory performance do result from decrements in semantic encoding processes, then decreased performance by the older adults, relative to the young, in the episodic memory tests should be accompanied by relatively smaller benefits of semantic priming in the lexical decision task.

Twenty-four young adults, with an average age of 19 years, and 24 older adults, with an average age of 67 years, participated in the present experiment. The average raw score on the WAIS Vocabulary subtest was 64 for both groups.

On each trial, a sentence context between four and eight words long was presented one word at a time at a single, central location on a video monitor. Each word in the sentence contexts was presented in lowercase. The subject's task was to make a word/nonword decision regarding a target letter-string, presented in uppercase, which was the final item in the sentence. Responses were made manually. Examples of the stimuli are shown in the first slide.

- - - -
slide 1
- - - -

Perceptually "easy" word targets contained fewer letters and possessed higher word frequency ratings than the perceptually "difficult" word targets. Individual word targets were counterbalanced across the three context conditions.

The analysis of the lexical decision reaction-time data for the word targets yielded significant main effects of age and perceptual difficulty, which represented longer reaction times for the older adults and for the perceptually difficult words. The context main effect was significant, and was composed of a 40 msec benefit for word targets in semantically congruous contexts, relative to the neutral context, and a 50 msec increase in reaction time for word targets in the incongruous contexts. This reaction time

increase is evidence that subjects were devoting attention to the sentence contexts. The Context x Perceptual Difficulty interaction was also significant, as a result of the fact that the context effect was larger in magnitude for the difficult target words than for the easy target words. No interaction involving age, however, was significant. As the next slide shows, the magnitude of the influence of the sentence contexts on reaction-time for the "word" responses was equivalent for young and older adults.

- - - -
slide 2
- - - -

The error data were in accord with the reaction times. The present experiment thus found no evidence for an age-related deficiency in semantic encoding ability, even in an attention-demanding task.

When subjects in the present experiment were asked following the lexical decision task, to recall as many of the word targets as they could, the young adults recalled significantly more words than the older adults. In a forced-choice recognition test given after the recall test, in which word targets from the lexical decision task were presented in a list with new words that had not been in the lexical decision task, the young subjects were also more accurate than the older subjects in recognizing which words had been targets. The recognition memory data are presented in the next slide.

- - - -
slide 3
- - - -

(As this slide indicates, both age groups found the perceptually difficult targets easier to pick out on the recognition memory test than the perceptually easy targets.)

The results of the recall and recognition-memory tests given in the present experiment resemble the findings of other investigations of episodic memory, in that an age-related deficit in performance was present. This deficit in memory performance, however, was not accompanied by a deficit in semantic encoding. The influence of the meaning of the sentence contexts on

the lexical decisions for the word targets was the same for older adults as for young adults. Although age differences in episodic memory may be related to some aspect of semantic processing, the present findings suggest that age differences in memory performance cannot be attributed to qualitative changes in those processes associated with the initial encoding of word meaning.

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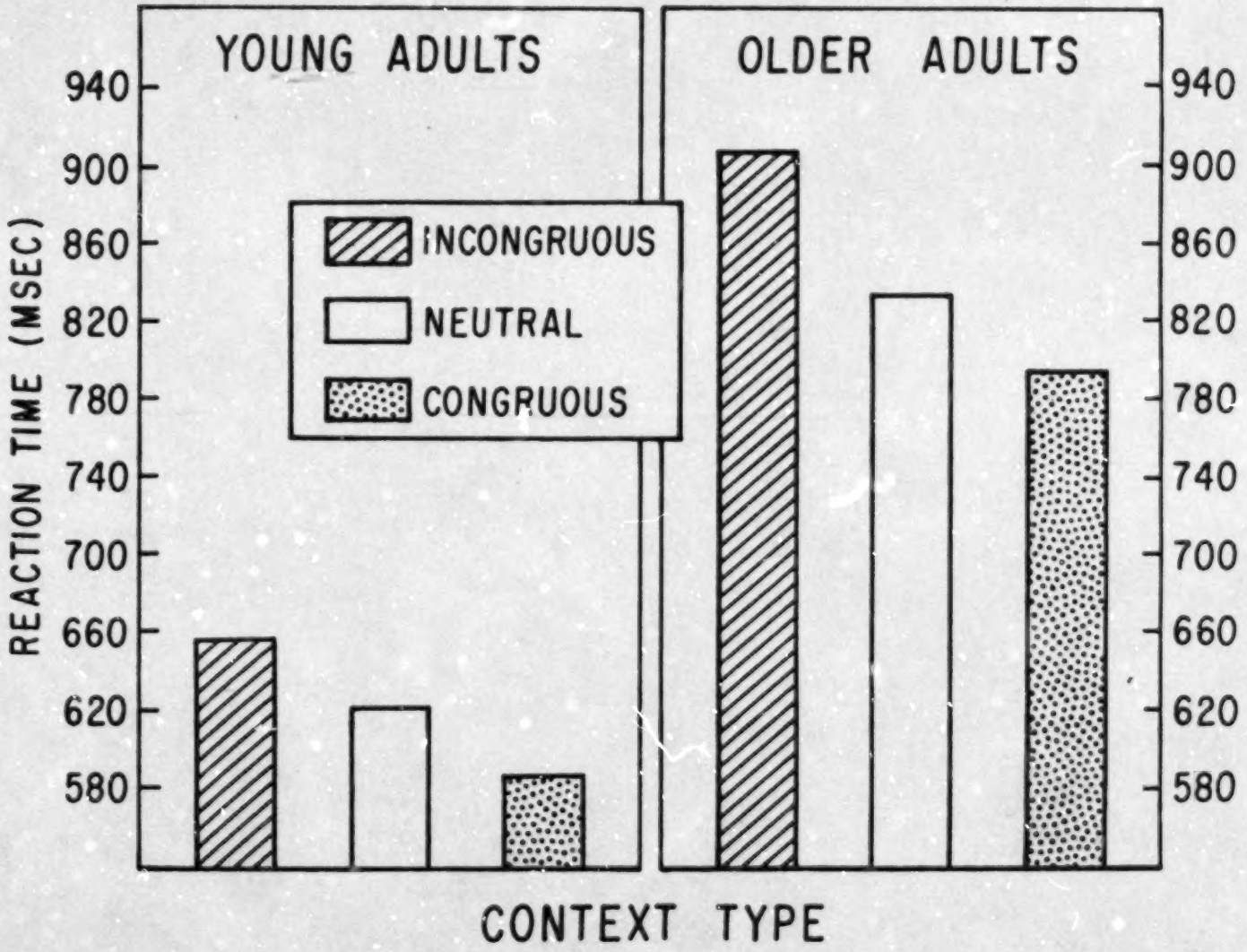
Table 1

Examples of the Sentence Contexts and Targets

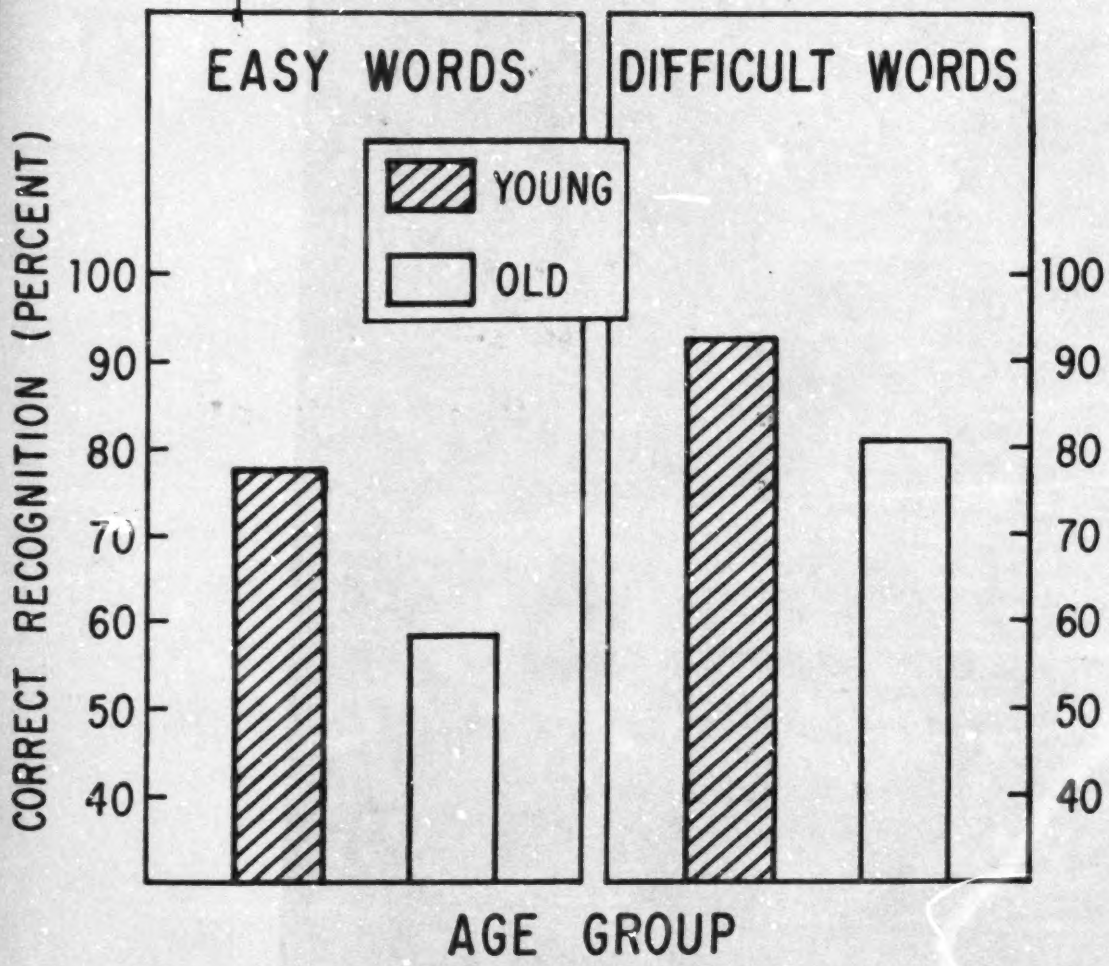
in Each Experimental Condition

Example Context	Target	Response	Context Type	Word Type
The accountant balanced the	BOOKS	Word	Congruous	Easy
The tennis player found the	RACQUET	Word	Congruous	Difficult
They said it was the	CHILD	Word	Neutral	Easy
They said it was the	PERCOLATOR	Word	Neutral	Difficult
The train went over the	CLOUDS	Word	Incongruous	Easy
The biologist examined the	CORRIDOR	Word	Incongruous	Difficult
The shortstop caught the	NILVER	Nonword	Nonneutral	-----
They said it was the	STORM	Nonword	Neutral	-----

skill 1


YOUNG ADULTS
OLDER ADULTS
INCONGRUOUS
NEUTRAL
CONGRUOUS
REACTION TIME (MSEC)
940
900
860
820
780
740
700
660
620
580
CONTEXT TYPE

Slide 2


EASY WORDS
DIFFICULT WORDS
YOUNG
OLD
CORRECT RECOGNITION (PERCENT)
100
90
80
70
60
50
40
AGE GROUP

slide 3